Forces and Motion

5-5 The student will demonstrate an understanding of the nature of force and motion. (Physical Science)

5-5.6 Explain how a change of force or a change in mass affects the motion of an object.
Taxonomy level: 2.7-B Understand Conceptual Knowledge

Previous/Future knowledge: In 3rd grade (3-5.3), students explained how the motion of common objects is affected by the strength of a push or pull and the mass of the object. They have not been introduced to the concept of a change in force or mass affecting the motion of an object in previous grades. They will further develop these concepts in 8th grade (8-5.4) when students will predict how varying the amount of force or mass will affect the motion of an object.

It is essential for students to know that the motion of an object can be affected by a change in force or a change in mass

Force
- If there are two objects with the same mass and one is acted on by a greater force than the other, the one acted on by the greater force will have the greatest change in speed.
- It will speed up the most or slow down the most in a given amount of time.

Mass
- If there are two objects, one with a greater mass than the other, and the same amount of force is applied to each object, the object with the lesser mass will have the greater change in speed.
- It will speed up or slow down more in a given amount of time.
- It is harder to change the speed of the object with the greater mass than the object with the lesser mass.

It is not essential for students to know that the change of speed of an object is called acceleration. Students also do not need to know the quantitative relationships among mass, acceleration, and force. Neither do they need to know the relationship between mass and inertia.

Assessment Guidelines:
The objective of this indicator is to *explain* how the motion of an object is affected by a change in force or mass of an object; therefore, the primary focus of assessment should be to a construct cause-and-effect model of how these factors affect motion of an object. However, appropriate assessments should also require students to *summarize* the effect on motion that a change in force or mass causes; *infer* from the factors whether they increase or decrease the rate of motion; *predict* how a given factor will affect the rate of motion; or *recognize* which factors increase rate of motion and which decrease rate of motion.